FLORIDA OIL SPILL HANDBOOK

Florida Department of Community Affairs

Tom Lewis, Jr., AIA, Architect
Secretary

Fla. Department of Community Affairs

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TO REPORT A SPILL CALL ANYTIME:

National Response Center 1-800-424-8802 (TOLL FREE)
Florida Marine Patrol 1-800-342-1829 (TOLL FREE)
Florida Department of Community Affairs
Division of Emergency Management 1-904-488-1320

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Tom Lewis, Jr., AIA, Secretary
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INTRODUCTION

Due to its geographic location, Florida is becoming increasingly vulnerable to potential oil spills. More tanker traffic, a rapidly increasing population, and most recently, offshore oil and gas drilling contribute to the risk of a spill.

Tankers transporting petroleum products to, from, and around the state pose the greatest potential threat for spills. Operational discharges from normal ship operations such as ballasting, tank cleaning, and bilge water pumping as well as the threat of collisions grow proportionately to vessel traffic. Estimates indicate that over one-third of the oil in the marine environment comes from these sources.

Increasing population levels generate a greater demand for fuels and other petroleum products. Transfers of these products between vessels and onshore terminals increase the potential for spills. In many cases the terminals, ports, and waterways which accommodate these transfers are in or near areas of recreational, ecological, or aesthetic significance. A major spill could have serious economic and environmental consequences for those interests deriving their livelihood from marine-related sources.

During recent years several major oil companies have either begun, or have applied for permits, to drill in offshore waters adjacent to Florida. Although the oil industry's record of spills from drilling activities on the average is low, the potential for a spill exists.

Since the 1970's, two notable oil spills have occurred within Florida's coastal waters. In August 1975, approximately 50,384 gallons of crude escaped from the Garvis into the Florida Keys; three years later, in October 1978, nearly 33,589 gallons of crude and distillate petroleum spilled from the cargo ship Howard Star into Tampa Bay.

According to the Florida Department of Natural Resources (DNR) from January 1981 to March 1985, 799 incidents affecting coastal areas were reported. A majority of those incidents (89%)

were rated as minor or medium spills (less than 10,000 gallons in coastal waters) with no major spills (more than 100,000 gallons) being reported. However, the frequency of such incidents since 1981 (on average 1 incident has been reported every 2 days) should prompt concerns about a heightened vulnerability of Florida's coastal ecosystem to potential spills.

The purpose of this handbook is to provide general information on the nature of coastal oil spills and the procedures to be followed in the event of a spill incident. Inland spill responsibilities are mentioned in the text, however coastal spills are the primary focus of this publication.

The information contained herein in designed to provide a generalized version of the Florida Coastal Pollutant Spill Contingency Plan for broader circulation to the public. It is not intended to replace or supplant the Florida Coastal Pollutant Spill Contingency Plan, the National Oil and Hazardous Materials Pollution Contingency Plan or the Hazardous Materials Annex to the Florida Comprehensive Emergency Management Plan.

SPILLED OIL IN THE MARINE ENVIRONMENT

Types and Properties of Oil [1]

The term oil is used to describe a wide range of petroleum hydrocarbons, from crude oil to various types of refined products such as gasoline and asphalt. These petroleum hydrocarbons differ greatly in both their physical and chemical properties which affect the behavior of slicks, weathering processes, persistence, ecological impact, and effectiveness of control and recovery within the marine environment. Table 1 lists oil types grouped into three categories with similar characteristics in terms of their physical, chemical, and toxicological properties.

Under warm summer conditions, all oil types weather rapidly, primarily by evaporation and solution into the water column, but also by emulsification, microbial degradation, and photooxidation. Evaporation from an oil slick is responsible for the loss of about one-fourth of most crude oil spills within 24 hours, representing those components that volatilize most readily. The evaporative losses from light crude oils and distillate fuels are greater than from heavier oils. The most volatile portions of crude and light distillate oils are also the most soluble, although evaporation is the dominant mechanism of loss in the early stages of spillage. Ecological damage from the water-soluble fractions is greatest for nearshore spills where fresh oil quickly enters shallow coastal habitats.

Oil can form either oil-in-water (o/w) or water-in-oil (w/o) emulsions. The o/w emulsions are readily distributed through the water column and increase the surface area of oil exposed to degradation processes. The w/o emulsions, known as "mousse", float and agglomerate into large masses which are viscous enough to substantially retard evaporation. They are very stable and inhibit the natural degradation of oil. Mousse has over twice the volume of the original oil and interferes with cleanup operations because of its vicosity. Mousse forms under high-energy conditions and can develop from all types of oil, from gasoline to asphalt.

The toxicity of spilled oil depends upon both the types and concentrations of hydrocarbons and related compounds present. However, certain trends in toxicity have emerged from studies of past spills and detailed laboratory experiments. Two types of toxicity must be considered for spilled oil: acute and chronic.

Table 1. Classification and properties of oil types with respect to their behavior during spills.

OIL TYPE	EXAMPLES	PHYSICAL/CHEMICAL PROPERTIES	TOXICOLOGICAL PROPERTIES
(1) Light, volatile oils	Distillate fuels such as gasoline, diesel, No. 2 fuel oil	· Spread rapidly · High evaporation and solubility rates · Tend to form unstable emulsions · Very toxic to biota when fresh · May penetrate substrate · Can be removed from surfaces by simple agitation and low pressure flushing	· Acute toxicity is related to the content and concentration of the aromatic fractions · Aromatic fractions are very toxic due to the presence primarily of napthalene compounds and, to a lesser extent, benzene compounds · Heavy molecular weight compounds are acutely less toxic, but may be chronically toxic since many are are either known or potential carcinogens will vary among species due to differences in the rates of uptake and release of these compounds · Mangroves and marsh plants may be chronically affected due to penetration and persistence of aromatic compounds in sediments
(2) Moderate-to-heavy oils	Medium-to-heavy paraffin-based refined oils and crude oils	· Moderate-to-high viscosity · toxicity variable depending on light fraction composition · In tropical climates, rapid evaporation and solution form less toxic weathered residue with toxicity due more to smothering · Light fractions may contaminate interstitial water · Tend to form stable emulsions under high · Variable penetration, a function of substrate grain size · High potential for sinking after weathering and uptake of sediment · Generally removable from water surface when fresh · Weather to tar balls and tarry residue	· Acute and chronic toxicity in marine organisms is likely to result from: 1) Mechanical or physical coverage - oil completely smothering organisms, often causing death 2) Chemical toxicity - results from the exposure of very toxic aromatic fractions of the oil to 3) A combination of mechanical or physical coverage and chemical toxicity · Mechanical or physical smothering causes acute physical toxicity in many marine organisms and chronic toxicity in many marine plants (especially mangroves)
(3) Residual oils	Asphalt, Bunker C, No. 6 fuel oil, waste oil	· Form tarry lumps at ambient temperatures · Nonspreading · Relatively nontoxic · May soften and flow when stranded in sun · Cannot be recovered from water surface using most clean up equipment · Easily removed manually form beaches	· Acute and chronic toxicity occurs more from smothering effects than form chemical toxicity, due to the small proportion of toxic aromatic fractions found in heavy, residual oils · Toxicity is more common in marine plants (especcially mangroves) and sedentary organisms than in mobile organisms · Acute and chronic toxicity also results from thermal stress, due to the elevation of temperatures in oiled habitats

Acute toxicity refers to short-term lethal effects (i.e., lasting less than 96 hours). Chronic toxicity refers to lethal effects which occur over longer periods of time.

In general, light volatile oils are more toxic (acutely and chronically) than moderate-to-heavy oils and residual oils. These differences in toxicity are related primarily to the different types and concentrations of toxic aromatic fractions within each type of oil. Light, volatile oils contain the highest proportion of highly toxic, low-molecular-weight aromatic fractions which are readily soluble in seawater and are rapidly accumulated by marine organisms. Moderate-to-heavy and residual oils usually contain considerably lower proportions of these low-molecular-weight aromatic compounds and are less toxic than light volatile oils.

The aromatic fractions of all three types of oil contain certain similar compounds, such as benzene or napthalene. Differences in acute toxicity among the three types of oil are related to differences in concentration of soluble aromatic derivatives. Acute toxicity varies among different species of marine organisms and is related to differences in both the rate of uptake and rate of release of these aromatic compounds. Aromatic compounds such as phenanthrene, which are rapidly accumulated and slowly released, are generally the most toxic. In general, benthic, estuarine species are more oil tolerant than pelagic, oceanic species. Additionally, adult forms of a species are generally more oil tolerant than juvenile or larval forms.

Chronic toxicity can result not only from the presence of aromatic compounds but also from mechanical or physical coverage which may smother many marine animals and plants. In general, oil coverage cuts off the oxygen supply to most species affected and usually results in death unless species have alternate metabolic pathways for dealing with conditions without oxygen. Moderate-to-heavy and residual oils have a higher potential to cause smothering than lighter volatile oils. In general, sedentary organisms and plants have a higher potential for being smothered than mobile organisms.

In addition to effects from aromatic fractions, chronic toxicity can also result from: (1) the accumulation and biological transformation of heavier-molecular-weight, less toxic compounds (many of which are known or suspected carcinogens), and; (2) thermal stress associated with the elevation of temperatures in oiled habitats. Examples of chronic toxicity have been observed in both red and black mangroves, mangrove tree crabs, and mangrove epiphytic prop root communities.

Sensitivity of Plants and Animals to Oil [1]

In addition to the differences in toxic effects of various oil types, plants and animals themselves possess different behavioral, physiological, and life-history characteristics which give each a relative sensitivity to spilled oil. One of the most significant factors is the ability of mobile animals to avoid spilled oil. Animals capable of avoiding spilled oil include whales and dolphins, terrestrial mammals which utilize coastal areas, certain coastal birds, adult marine fishes, and certain invertebrates.

During the *Ixtoc 1* oil spill in Texas in 1979, dolphins and mullet avoided oiled nearshore waters. Coastal birds either avoided these oiled beaches entirely or used back-beach areas which were less oiled. Ghost crabs moved further up the beach face to avoid the oiled foreshore. During the *Peck Slip* oil spill in Puerto Rico in 1978, mangrove periwinkles moved out of oiled mangroves. By avoiding oiled areas, these animals avoided toxic exposure to oil.

Other animals which are less mobile are prone to be impacted. These include small burrowing worms, clams, beach hoppers, and mole crabs. At oiled sand beaches during the *Ixtoc 1* spill, a significant decrease in the numbers of infaunal organisms was noted. Oil from the *Peck Slip* caused significant damage to communities of animals inhabiting algal growths on mangrove roots. These animals were small and had a limited habitat; thus, they were forced to remain in oiled habitats.

Sessile animals and rooted plants have no means of avoiding oil. This is true of oysters, marshes, seagrasses, and red algae, which form biogenic substrates over large areas along the Florida coast. Should oil lead to the death of these organisms, substrate formation and retention could be interrupted and habitats could disappear entirely, especially if substrates sustain heavy oiling. This could lead to a direct loss of habitat for residents of oiled areas, a loss of food and forage value to animals which visit these environments, and failure of seagrasses or marshes to be recolonized.

In almost all known cases, oil spills in the Gulf of Mexico and the Caribbean Sea have failed to impact subtidal environments, except for those immediately adjacent to oiled shorelines. During these spills, physical or chemical impacts to seagrasses were not observed. For this reason, subtidal areas were considered as less oil-sensitive environments than others.

Oil spills in the Gulf of Mexico and the Caribbean Sea have, however, often resulted in heavy physical impact to intertidal communities. During the Peck Slip spill, oil floated over seagrass beds and red algae, and physically impacted intertidal communities. In all of the spills where mangrove forests were impacted, the toxic effects were greater than in other habitats. Long-term damages to fringing red mangroves are known to follow major oil spills.

Animals and plants may have protective body coverings which prevent oil from contacting tissues. For example, the impervious shell and plates of barnacles and periwinkles allow these animals to avoid tissue contact with oil. The relatively impervious seed coat of the red mangrove may allow the propagule to survive short-term exposures without toxic effects. Other plants and animals such as algae, anemones, beach hoppers, worms, and larval fishes have no effective covering to prevent direct oil-tissue contact. Animals and plants also exhibit physiological differences when exposed to oil. Beach hoppers and larval fishes are extremely sensitive to low concentrations of light volatile oils which some species of polychaete worms are tolerant, often increasing in numbers following an oil spill.

Susceptibility of organisms to spilled oil may vary seasonally according to their life stage and/or natural history. Some animals which are usually highly mobile and capable of avoiding oil such as wading birds, shorebirds, and sea turtles, are obligated to return to or remain at certain nesting and staging sites in order to breed and feed and therefore may be more susceptible to oil at these times. This may expose the breeding adults, eggs, and young of a mobile species during an oil spill. The young of some species may be the most sensitive to the toxic effect of spilled oil. Avoidance of oil by young birds, reptiles, and fishes may be less than that of adults; protective coverings may not be as well developed; and even a temporary or low-level interruption of physiological balance may lead to death of a younger or larval animal.

OIL SPILL CONTINGENCY PLANNING

In Florida, response planning for oil spills is predicated upon federal-state procedures and predesignated responsibilities, a series of atlases depicting sensitive areas along the shoreline, and a network of cooperative cleanup contractors. Working in concert, each of these facilitate preparation for a spill incident.

Federal

The Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977 place the primary resonsibility for spill containment and cleanup on the spiller. Only when the spiller refuses to take action or is not taking proper removal action does the federal government assume responsibility for removal. The Clean Water Act established the National Oil and Hazardous Materials Pollution Contingency Plan as the basis for federal response to spill incidents.

The National Plan has been supplemented on a regional basis. As part of the regionalized concept, the Coastal Region IV Contingency Plan has been developed for application in Florida. This plan only applies to coastal areas. Other coastal states under the Region IV Plan include: North Carolina, South Carolina, Georgia, Alabama, and Mississippi (note: Tennessee and Kentucky are the noncoastal states in region IV). Within the framework of Region IV, there are separate response plans for coastal, as well as inland discharges (published by EPA). The coastal plan has been developed and is being maintained in an operational status by the U. S. Coast Guard. The Marine Safety Offices of the U.S. Coast Guard in Florida are given on page 9. The inland plan has been developed and is being maintained in an operational status by the Environmental Protection Agency.

For both the coastal and inland plans a federal Regional Response Team (RRT) has been established. Figure 1 shows federal agency representation on the RRT. In the event of a major spill, the RRT may be activated for containment, cleanup, and damage assessment upon recommendation by the On-Scene Coordinator or any member of the Regional Response Team (RRT).

State

Primary state authority for coastal spill containment and cleanup is found in Chapter 376, Florida Statutes, "Pollutant Discharge Prevention and Removal". This statute charges the

U.S. Coast Guard Marine Safety Offices

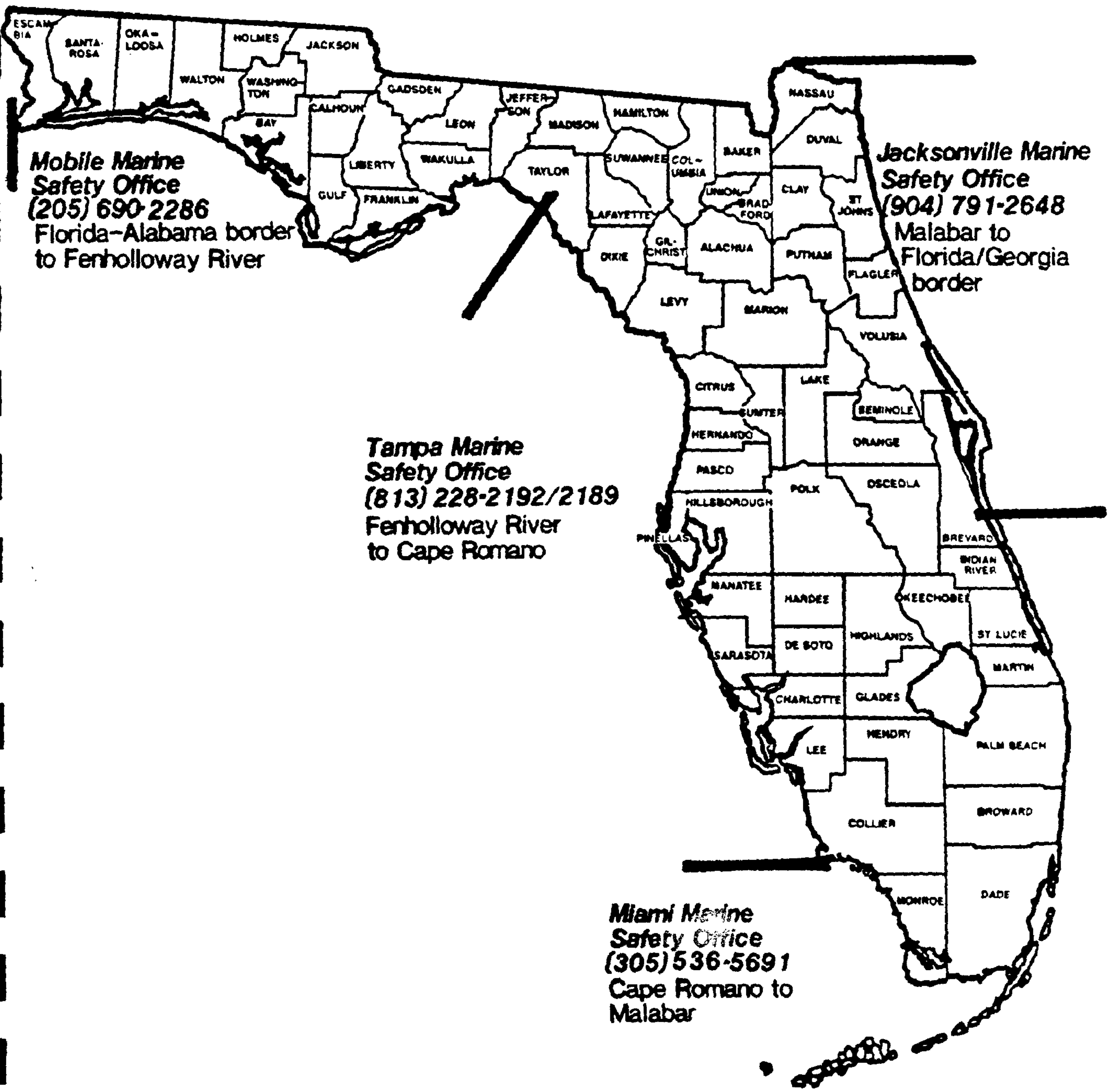
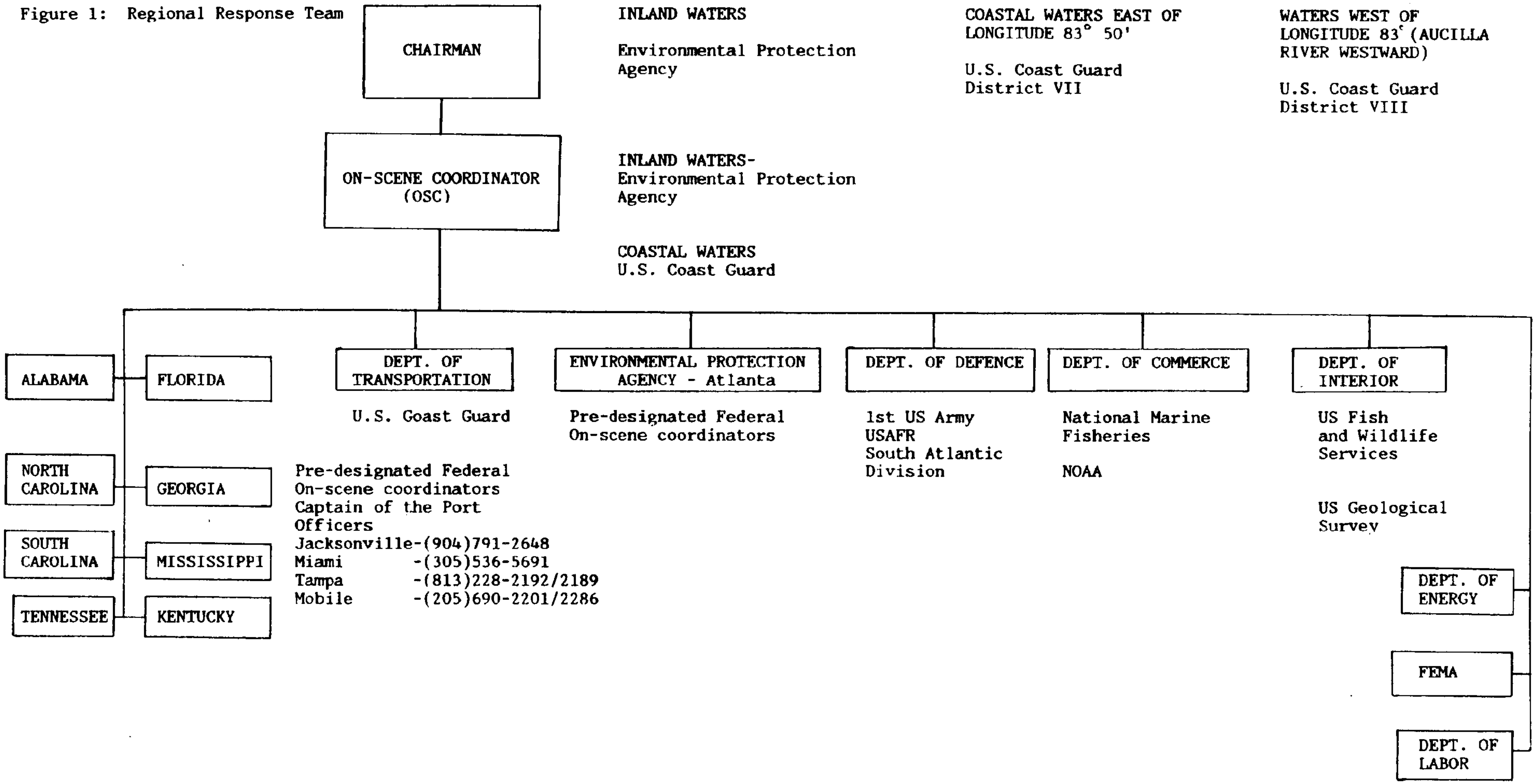


Figure 1: Regional Response Team



Department of Natural Resources (DNR) with state responsibility for oil spill control in coastal waters.

As part of this responsibility, DNR has developed the Florida Coastal Pollutant Spill Contingency Plan. This plan is designed to complement the national and regional plans by providing a coordinated state response to major coastal spills.

Similar to the federal approach, Florida has established a state response team known as the State Hazardous Materials Task Force. The task force is comprised of numerous representatives from state agencies that have legal jurisdiction to respond to hazardous material incidents. It would be activated to support the actions of a single state agency with additional state resources when an incident is beyond the capabilities or scope of one agency to respond to an incident. In response to a major coastal oil spill, the DNR would act as chairman and the DCA would be vice chairman. Other agencies would be responsible for the coordination of their resources, thereby assuring a comprehensive response to the emergency.

Figure 2 shows state agency representation on the task force. Within the DNR Division of Law Enforcement, the Florida Marine Patrol has primary responsibility for responding to oil spills. The district offices of the Florida Marine Patrol are shown on page 13.

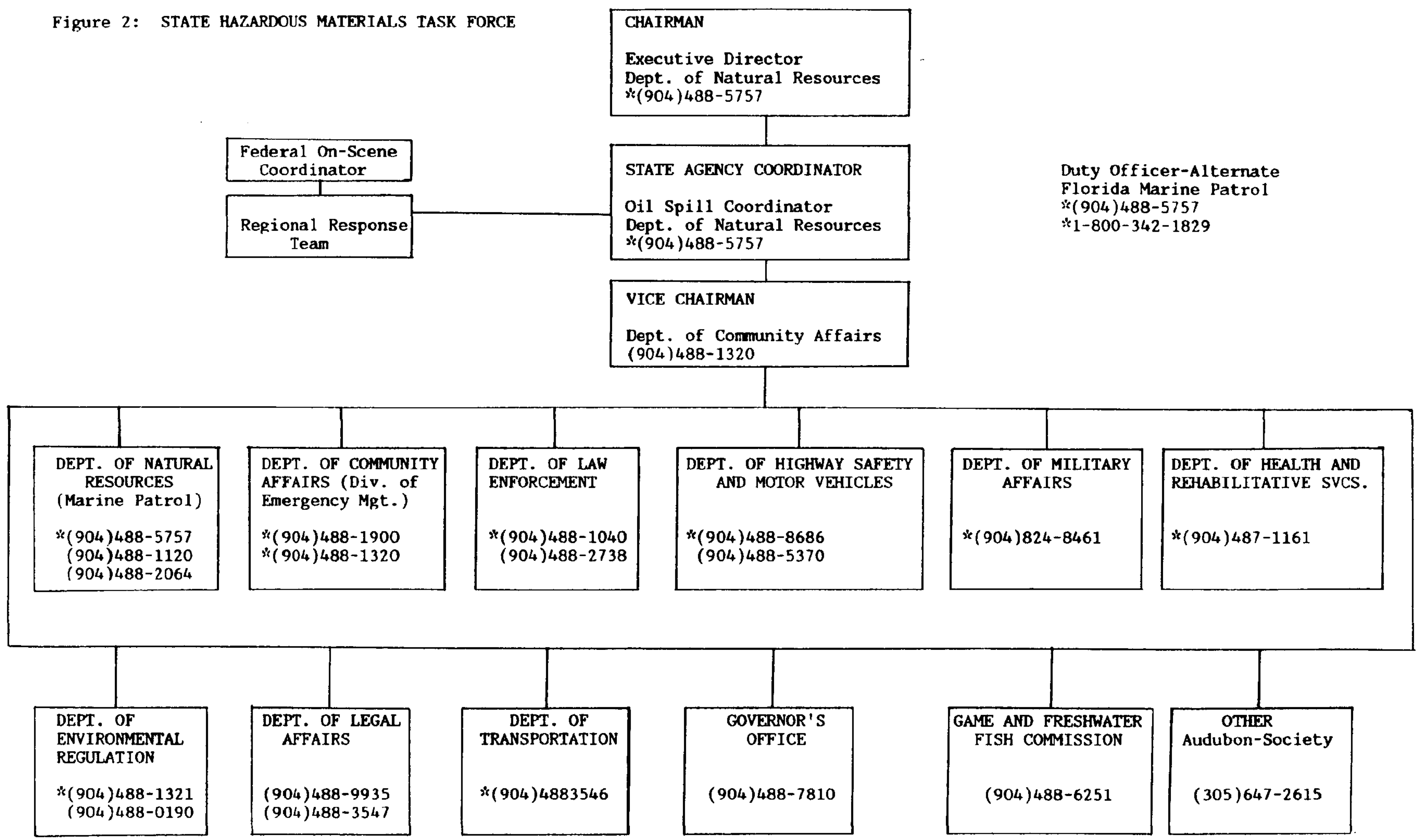
In most cases, DNR and the U.S. Coast Guard will coordinate on spill response. The U.S. Coast Guard usually takes the lead role with the federal On-Scene Coordinator assuming primary responsibility. The State may expend funds from the Florida Coastal Protection Trust Fund in response to a pollutant discharge.

Coastal Sensitivity Mapping [1]

As part of the State's overall spill planning effort the Department of Community Affairs (DCA), through the federal Coastal Energy Impact Program, contracted for Environmental Sensitivity Index (ESI) mapping of the Florida coastline. This type of mapping, conducted by the Research Planning Institute, Inc., was based upon an environmental sensitivity index which integrated geomorphic, biologic, and living resource information into a composite indication of coastline sensitivity to spilled oil.

This was accomplished by indicating areas critical to fish, reptiles, birds, and marine mammals for feeding and reproduction with color-coded wildlife symbols. These symbols include the seasons in which these species use certain areas. Access points

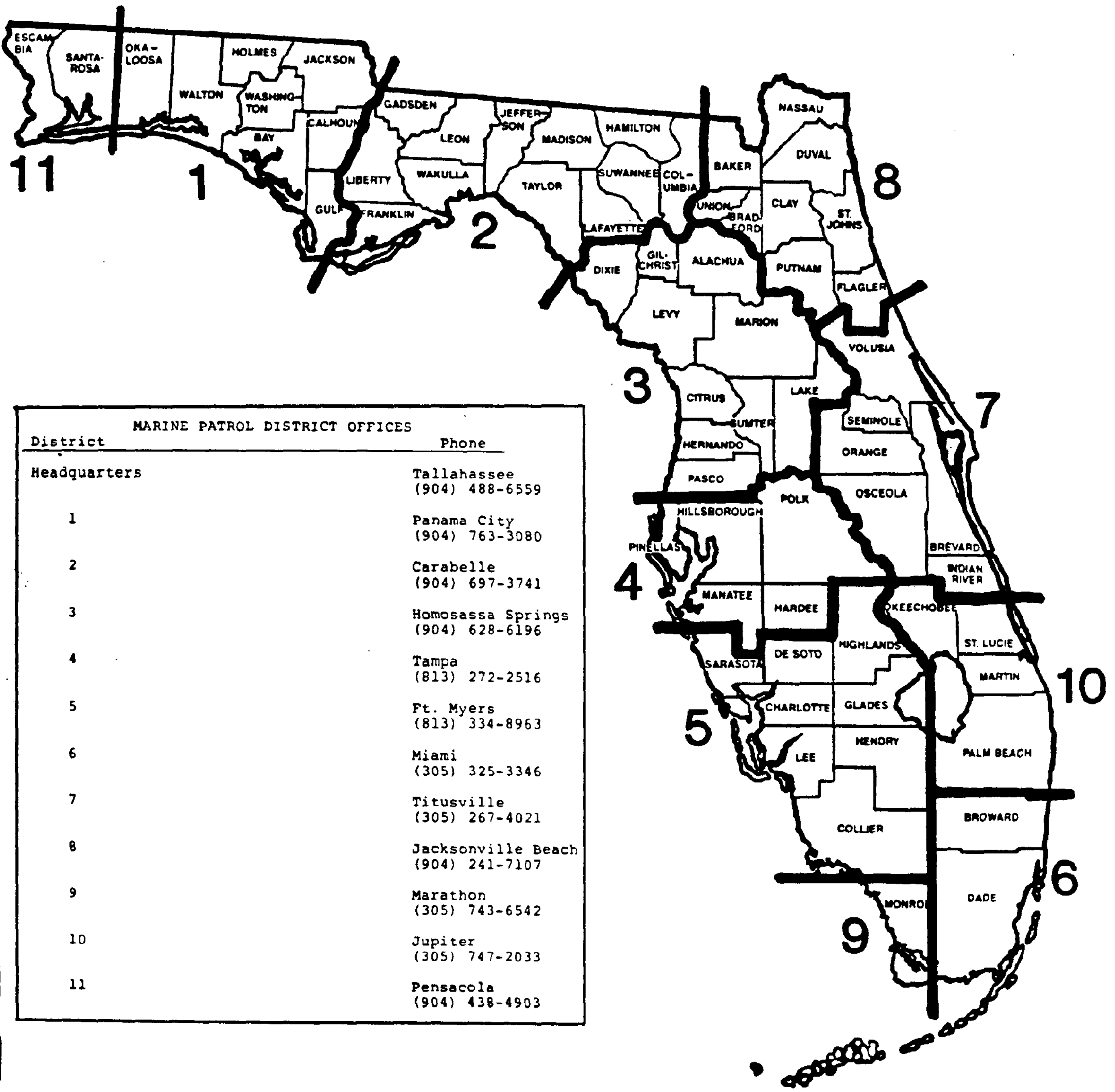
Figure 2: STATE HAZARDOUS MATERIALS TASK FORCE



*24-hour number

Florida Marine Patrol District Offices
Department of Natural Resources

PHONE TOLL FREE 1-800-342-1829



MARINE PATROL DISTRICT OFFICES

District	Phone
Headquarters	Tallahassee (904) 488-6559
1	Panama City (904) 763-3080
2	Carabelle (904) 697-3741
3	Homosassa Springs (904) 628-6196
4	Tampa (813) 272-2516
5	Ft. Myers (813) 334-8963
6	Miami (305) 325-3346
7	Titusville (305) 267-4021
8	Jacksonville Beach (904) 241-7107
9	Marathon (305) 743-6542
10	Jupiter (305) 747-2033
11	Pensacola (904) 438-4903

to the shore and facilities such as marinas and boat ramps are also indicated on the maps along with potential locations for the placement of containment and removal equipment.

ESI maps were first tested during a major oil spill following the Ixtoc 1 blowout in the Gulf of Mexico. The ESI maps became an integral part of the overall federal response plan to protect the Texas coast, providing the scientific basis for setting protection priorities and cleanup strategies. Since then, ESI mapping has been carried out in Massachusetts, South Carolina, the remainder of Texas, Southern California, Washington (Puget Sound), and Alaska (Shelikof Strait, Pribilof Islands, Norton Sound, and Bristol Bay).

A series of these color maps, or Coastal Sensitivity Atlases, has been provided to all appropriate spill response agencies within the State. Additionally, black and white versions of the atlases have been distributed by coastal Regional Planning Councils to other interested parties.

Spill Cleanup Cooperatives [2]

Florida is the only state in the country which has a statewide spill control association. The Florida Spillage Control Association, Inc., is comprised of regional pollution control cooperatives whose representative interests are governmental agencies, ports, waterfront industries, oil companies, and other similar members.

The purpose of this organization is to maintain information on the availability of pollution control equipment, keep members apprised of technological advances, provide educational programs and demonstrations, and act as a clearinghouse between industry, government, and the general public.

Of special significance is the association's current knowledge of the availability of spill prevention and cleanup organizations, both public and private, operational within the State. This information is readily available to other association members as well as DNR, Florida Marine Patrol, and U.S. Coast Guard, for a more expeditious spill response (see Appendix C).

RESPONSE PROCEDURES

WHAT TO DO IF YOU CAUSE OR SEE AN OIL SPILL

1. Use the Spill Report Checklist on Page 17 to note spill characteristics and weather conditions.

2. Notify priority contacts! DON'T DELAY, even if you are unable to provide all checklist information.

   DEPARTMENT OF NATURAL RESOURCES
   24 Hour Toll Free 1-800-342-1829 or
   see page 13 for Florida Marine Patrol Districts

   FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS
   DIVISION OF EMERGENCY MANAGEMENT
   24 Hour Emergency Number 1-904-488-1320

   NATIONAL RESPONSE CENTER
   24 Hour Toll Free 1-800-424-8802 or
   see page 9 for U.S. Coast Guard Offices

3. State law maintains the right of any person to render assistance in containing or removing a pollutant. However, TO QUALIFY FOR REIMBURSEMENT OF EXPENSES and to coordinate with federal and state authorities:

   GET APPROVAL FROM DNR OR THE U.S. COAST GUARD BEFORE ATTEMPTING ANY CLEANUP ACTION.

   In most cases, unless you are a qualified contractor or marine operator, containment and cleanup should be left to trained personnel.

4. Be available to answer questions from authorities.

Estimating Oil Spill Movement and Volume [3]

Oil slicks move under the influence of wind and current. Wind is a prominent factor on open water. A slick usually moves at a speed of 2 - 4 percent of the wind velocity and, in the northern hemisphere, slightly to the right of the direction in which the wind is blowing. In the absence of wind, and in places such as rivers, currents will control the slick's movement.

A rough estimate of the volume of oil on the water can be made from the appearance of the slick.

(1) A barely discernible slick indicates 25 gallons per square mile.

(2) A silvery sheen indicates about 50 gallons per square mile.

(3) Faint colors in the slick indicate 100 gallons per square mile.

(4) Bright bands of color indicate 200 gallons per square mile.

(5) Dull brown indicates 600 gallons per square mile.

(6) Dark brown indicates 1300 gallons per square mile.

SPILL REPORT CHECKLIST

To assure that responsible agencies can take immediate, effective action the following information should be provided as completely as possible. DO NOT DELAY, however, in notifying priority contacts even if you are unable to provide all information.

Date and Time ______________________________

Type of Oil (see page 3 for description):

Light, volatile oils__________

Moderate to heavy oils __________

Asphalt, Bunker C, No. 6
fuel oil, waste fuel __________

Other (not oil, specify) ______________________________

Location ______________________________
Latitude and Longitude if possible; also landmarks.

Source of Spill (if known) ______________________________

If a vessel is the source:

Name ______________________________

Approximate Size ______________________________

Port of Registry ______________________________

Spill due to (if known): ______________________________

Collision____ Fire ____

Grounding ____

Other (i.e., leak, spilled container)

____

Injuries ______________________________

SPILL REPORT CHECKLIST (cont'd.)

Volume of Spill (Check One)

Standard Term	Gallons Oil/ Square Mile	Appearance
barley visible	0-25	barely visible under favorable light
silvery	50	silvery sheen on surface water
brightly colored	200	bright color bands visible
dull	600	colors turn dull brown
dark	1,300	much darker brown

Note: A one-inch thickness of oil equals 5.61 gallons per square yard or 17,378,709 gallons per square mile.

Water Depth ______________________________

Tide ______________________________

Weather Conditions ______________________________

Current Speed and Direction ______________________________

Wave Height and Direction ______________________________

Action Taken to Clean up Oil Spill ______________________________

____

____

Operational Response

Florida's policy concerning oil spill response is to withhold state funds unless the federal government declines responsibility or no federal resources are available. This places primary responsibility for containment and clean-up on the U.S. Coast Guard. The Coast Guard provides the OCS for the coastal zone only. EPA provides the OSC for the inland zone.

Under most circumstances response is based upon notification, verification, and activation (Figure 3). When a spill is detected, the U.S. Coast Guard, Florida Marine Patrol or DCA Division of Emergency Management must be notified. See pages 9 and 13 for appropriate DNR contacts. A DNR officer will be dispatched to determine the size and severity of the discharge.

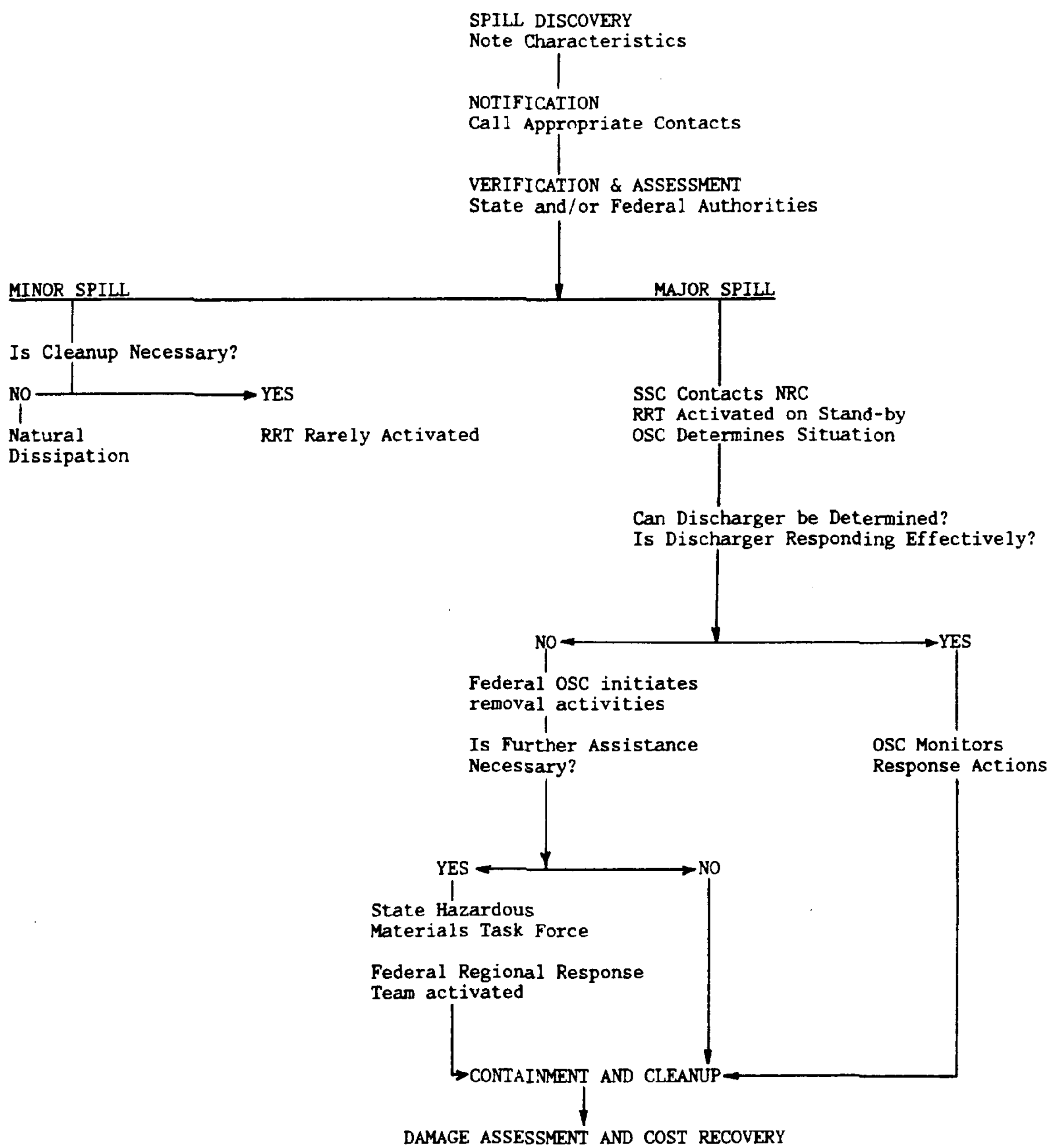
Spills are generally classified as minor, medium, or major depending upon the location of the spill and the amount and type of product discharged (note: classes are defined in National Contingency Plan). For example, a 5,000 gallon discharge of a highly volatile fuel in the open ocean under heavy sea conditions might be considered less severe than a 1,000 gallon spill of heavy, residual oil in an enclosed, sheltered area fringed by mangroves. The officer responding to the call generally makes this determination and has the Coastal Sensitivity Atlases available for reference purposes.

If, due to the considerations involved, a spill is determined to be a MAJOR discharge the National Response Center will be notified. The National Response Center will then contact the appropriate Marine Safety Office of the U.S. Coast Guard.

A Coast Guard On-Scene Coordinator (OSC) will be dispatched to oversee containment and cleanup operations for spills in the coastal zone. Generally, the party responsible for the discharge will be responsible for these operations. In the event the polluter cannot be determined or at the discretion of the OSC operations are not being undertaken effectively, federal RRT and, if appropriate, state and local resources will be activated.

Most responsible marine operators have spill contingency plans in effect. These generally involve employment of a prearranged contractor with appropriate equipment and trained personnel, such as those participating in the Florida Spillage Control Association. (See Appendix C for a list of these contractors.)

OIL SPILL RESPONSE



OSC	On-Scene Coordinator
SSC	State Spill Coordinator
RRT	Federal Regional Response Team
NRC	National Response Center

Three Basic Steps in Responding to an Oil Spill [3]

1. Limiting the Spill:

   In most cases, the means of limiting a spill are evident: close a valve, cease pumping through a ruptured fuel line, or plug a leak. Even though the proper corrective action is often obvious, such action is not always promptly taken.

   Sometimes there are ways other than the obvious to lessen the amount of oil spreading onto the water. If a pollutant is leaking from a shoreline facility, sandbagging or a temporary dike might prevent it from draining into the water. In the case of a grounded tanker or barge, the transfer of the pollutant to another vessel might be a way to limit the spill.

2. Containing the Spill:

   Containing an oil spill means preventing its spread over the surface of the water. There are several advantages to containment. First, it makes it easier to remove the oil from the water. Second, holding the oil near the ship, pier, or terminal from which it was spilled localizes the problem and minimizes pollution.

   Oil can be contained by means of a barrier which is either a floating boom or a bubble barrier. Both these methods have limited use conditional upon the sea state. A floating boom is the most common method used for controlling spills in harbors and other areas where transfers of product take place. Booms consist of a tubular floating section, either inflatable or filled with a buoyant material. Below the floating section there is usually some form of weighted skirt to trap the product both at the surface and below the water line.

   The boom sets up a simple physical barrier that contains the oil. Once the slick has been contained, the perimeter of the boom can be reduced by drawing the boom in from one side or the other. This concentrates the pollutant and makes it easier to remove.

   In addition to the many commercially available floating booms, makeshift booms are sometimes used; these can be an inflated fire hose, linked railroad ties, telephone poles or other similar devices.

   A bubble barrier consists of submerged, perforated tubing from which compressed air is released. The result is a rising curtain of bubbles and an upwelling of the water surface above the tubing. Bubble barriers are comparatively new and are used in some harbors. The advantage of this type containment is that it does not interfere with the movement of vessels.

3. Removing the Spill:

Following the containment of an oil spill, the most satisfactory method of cleanup usually is physical removal of the oil from the water. This is called "skimming" and may be done by a specially equipped vessel, a pumping device, or other equipment.

In general, skimmers have equipment to:

(a) remove pollutants from the waters;
(b) separate pollutants from the waters, and;
(c) store the recovered pollutants.

One type of skimmer vessel has adjustable booms to guide the slick into wells located on its sides. A mixture of oil and water is pumped from the well to tanks, where the oil is separated from the water with the clean water being discharged overboard.

Another type of skimmer has a bow-mounted absorbent roller to soak up oil and water. As the roller rotates, it is squeezed at a calculated pressure to remove the water. A second squeeze is then made which removes the oil.

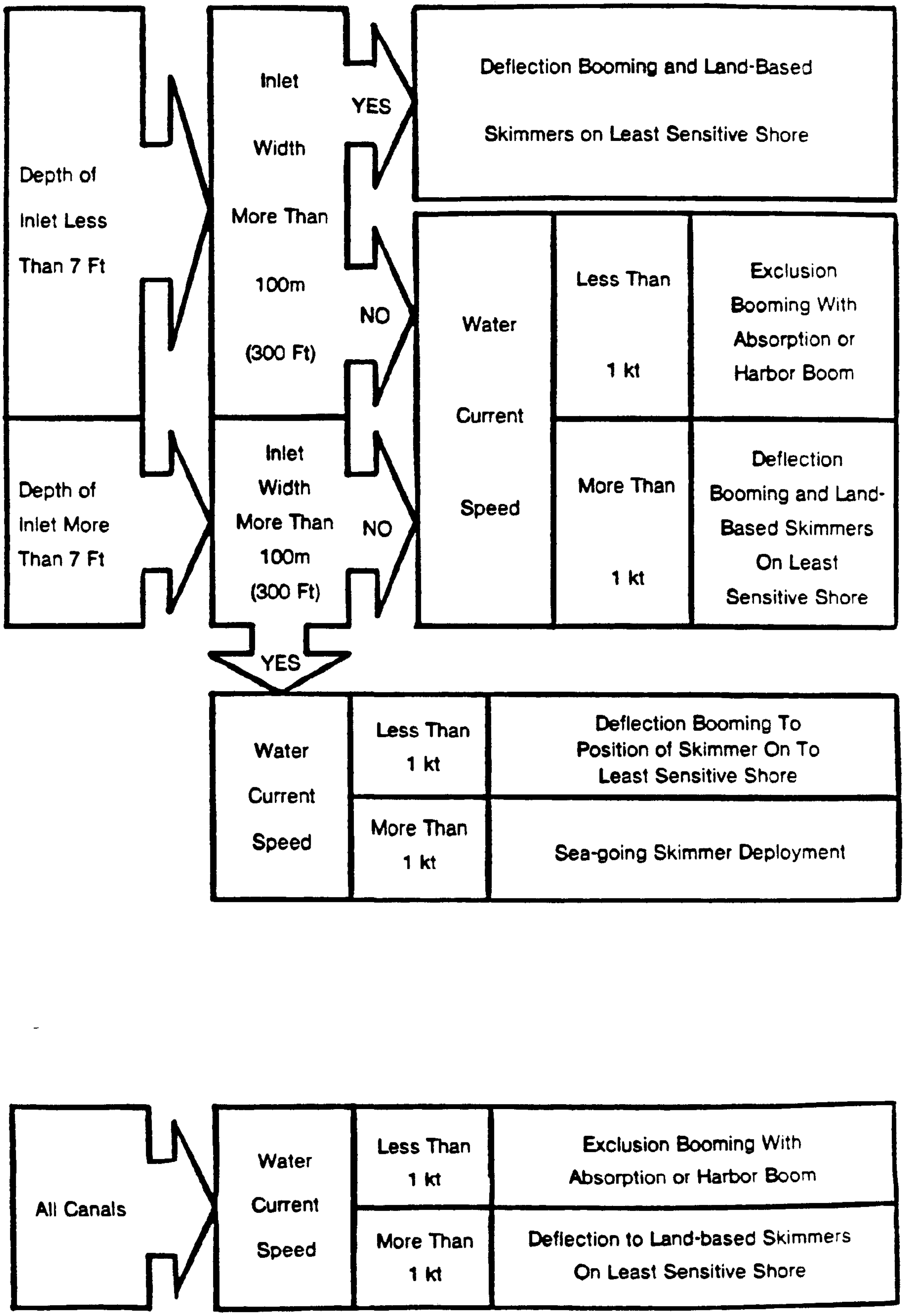
Oil recovery barges are also used for skimming. They employ pump-driven suction equipment to pick up a mixture of oil and water.

Floating surface skimmers can also be used to remove pollutants from the water. These devices are raftlike and have no means of propulsion. They are moored in place where oil collects and usually pump recovered oil to storage tanks located on shore or into holding barges.

Manual removal is also a useful method of removing the pollutants, especially with a small quantity. After the spill is contained, absorbent material is placed into the pollutant to remove the pollutant from the water. The pollutant-saturated sorbent is then removed by dip-nets or other means and then disposed of appropriately.

Removal methods are dependent upon several factors such as water depth, water body width (especially in the case of inlets), and water current speed (see page 23).

DECISION KEY TO DETERMINE PROTECTION MEASURES



Use of Chemical Dispersants [4]

If physical containment and collection of spilled oil is judged infeasible, use of chemical dispersants may be considered as an alternative means to minimize environmental damage. Dispersants are chemical compounds which accelerate the natural evaporation and suspension of oil particles. These chemicals generally react most effectively in heavy seas which would inhibit physical containment and removal.

Dispersants shall only be used with the permission of the Federal On-Scene-Coordinator. Due to the potential toxicity of some dispersants, use of these chemicals are strictly controlled. Only EPA-approved dispersants may be used in Florida waters on major spills and then only under certain circumstances and in certain locations.

Suggested Oil Spill Containment and Removal Guidelines [5]

The cleanup of land areas, beaches, boat harbors, bulkheads, and so forth will be necessary if these areas are contaminated with an oil pollutant. Different substrates require different cleanup methods for maximum environmental protection and effectiveness (see page 25). It is extremely important that the measures taken to restore contaminated areas do not create a greater hazard to the environment than the oil spill itself. Some cleaning agents are toxic to marine life. Therefore, only the physical and mechanical removal of the oil may be used without the prior written consent of the Florida Department of Environmental Regulation.

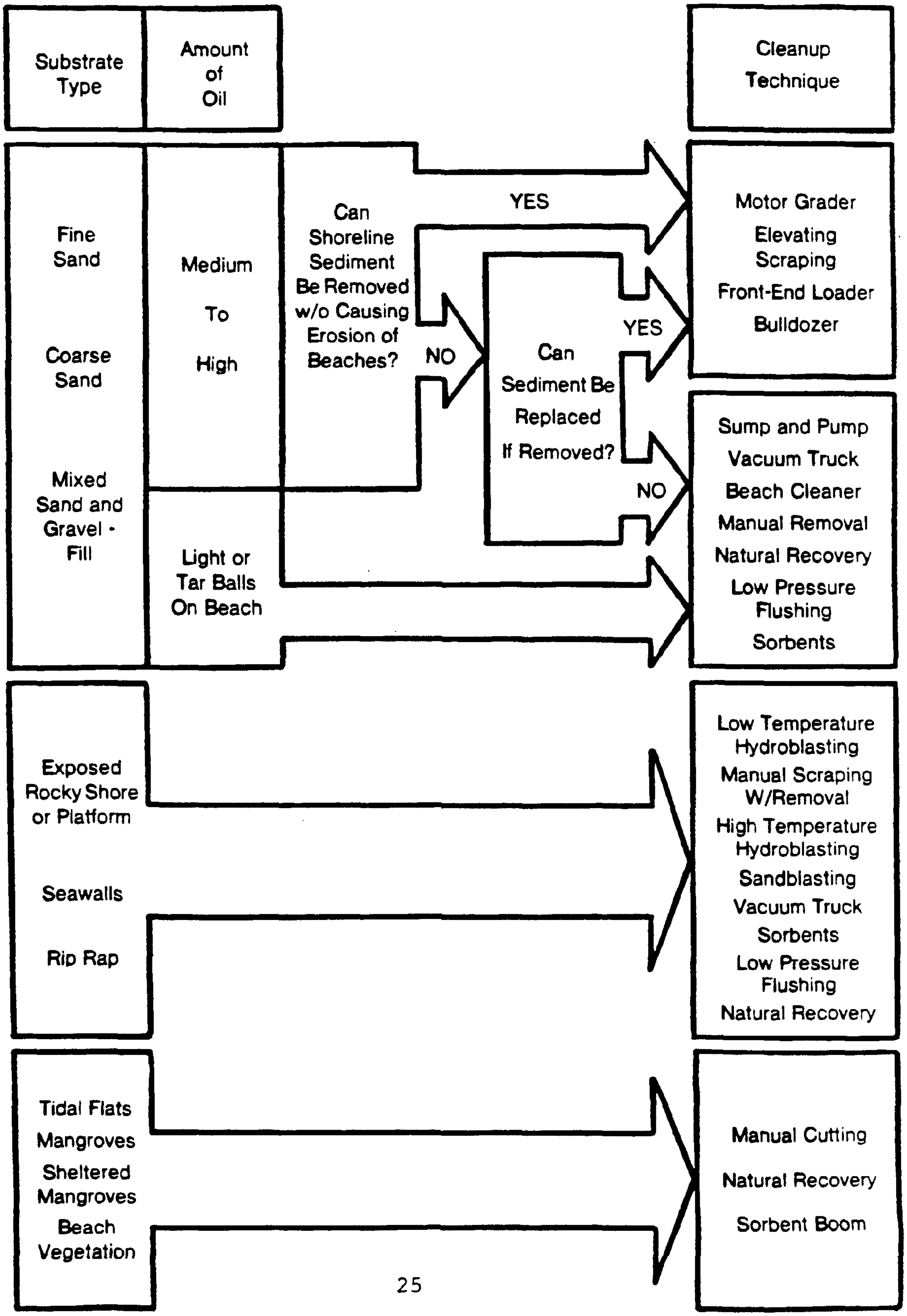
Harbors, Marinas, and Lagoons

Harbor cleaning procedures involve encircling the spill with a boom, then concentrating the spill by shortening the boom, and skimming the oil off the surface with vacuum tank suction. This method can be used in conjunction with applying absorbent or adsorbent materials to the spill. Water jets from hoses can also be used to direct oil from congested areas, pilings, and so forth and concentrating it for later removal.

Sandy Shorelines and Beaches

Techniques for the physical removal of oil contamination from shorelines and beaches include the use of vacuum trucks to pick oil directly from the shorelines and/or beaches, the application and subsequent removal of an absorbent, or adsorbent, and the removal of oil contaminated sand. When there is little danger of the oil penetrating deeply into the sand, efforts should first be directed to its removal in the liquid state. When the oil is

DECISION KEY FOR CLEANUP OF DIFFERENT SUBSTRATES



highly treated (chemically) or of low viscosity such that it will penetrate into the sand, an absorbent should be applied. The absorbent will have to be worked with hand rakes to obtain good absorbing action. No techniques have been developed for mechanized agitation or pickup; therefore, this requires a tremendous amount of manual labor. The restricted use of heavy construction equipment for the removal of oil contaminated sand may be required, but only through the Department of Natural Resources (DNR). Large, flat, sandy beaches may be restored by removing a layer of sand of uniform thickness, but this action can only be taken with the approval from the Department of Natural Resources. Equipment preferred in order of decreasing effectiveness include graders, elevating scrapers, and front-end loaders. Because of their tendency to spread oil contamination deeper into the sand, tracked vehicles should only be used as a last resort.

Rocks and Sea Walls

Methods of cleaning rocks include sandblasting, hydroblasting, wet sandblasting, steam cleaning, and hot water blasting. Usually rock cleaning will be performed adjacent to the surf making it very difficult to accomplish complete removal of the oil. Experience has shown that care must be exercised in cleaning rock next to residential or environmentally sensitive areas to prevent the wind from carrying the contamination onto previously uncontaminated surfaces.

State-Funded Cleanup Expenses [3]

In order to insure control and documentation of state-funded cleanup activities, the following procedures have been established for expending cleanup funds from the Coastal Protection Trust Fund.

1) All authorities for State-funded cleanup activities will require the prior approval of at least two of the following three individuals within the Department of Natural Resources:

   Executive Director
   Assistant Executive Director
   Oil Spill Coordinator

2) The Department of Natural Resources Oil Spill Coordinator shall be responsible for the review and verification of all invoices submitted by cleanup organizations. This will include the reconciliation of these invoices with the oil spill investigative reports compiled by the Marine Patrol. Subject invoices will not be dispersed for payment from the Coastal Protection Trust Fund without approval by the Oil

Spill Coordinator and the Executive Director of the Department of Natural Resources.

3) Prior to any state-funded cleanup activities being initiated, an agreement will be executed and signed by a representative of the cleanup organization that will be utilized in the response.

4) The Department of Natural Resources Oil Spill Coordinator will be responsible for negotiating this agreement with the contractor.

APPENDIX A

EMERGENCY RESPONSE AGENCIES

<u>FLORIDA MARINE PATROL</u>	(TOLL FREE)	*1-800-342-1829
<u>NATIONAL RESPONSE CENTER</u>	(TOLL FREE)	*1-800-424-8802
<u>DIVISION OF EMERGENCY MANAGEMENT</u> (DCA)		*(904) 488-1320 SC 278-1320
Environmental Protection Agency (Atlanta)		*(404) 881-4062
U.S. Coast Guard (RRT Activation)		
Seventh District	working hrs after hrs	(305) 536-5651 (305) 536-5611
Eighth District	working hrs after hrs	(504) 589-6296 (504) 589-6225
Florida Marine Patrol (DNR) Oil Spill Coordinator		*(904) 488-1992 SC 278-1992

SC - Suncom
* - 24 hours

APPENDIX B

COASTAL COUNTY CONTACTS

In most cases local governments will defer to the U.S. Coast Guard and/or the Florida Department of Natural Resources for spill containment and clean-up. In the event a spilled pollutant does contact the shoreline, the following contacts might be helpful in providing local assistance, such as disposal sites or availability of equipment.

NOTE: For reference purposes counties are listed by U.S. Coast Guard Marine Safety Office jurisdicitons.

COUNTY (County Seat):

** Mobile Marine Safety Office

** AREA CODE (904)

ESCAMBIA (Pensacola)	
County Administrator	436-5777
Civil Defense Director	436-5777
SANTA ROSA (Milton)	
Civil Defense Director	623-0588
WALTON (DeFuniak Springs)	
Civil Defense Director	892-3196
BAY (Panama City)	
County Manager	796-8306
Disaster Preparedness Director	796-8306
GULF (Port St. Joe)	
Civil Defense Director	653-8977
WAKULLA (Crawfordville)	
Civil Defense Director	926-7636
TAYLOR (Perry)	
County Coordinator	584-3531
Civil Defense Director	584-6413

** <u>Tampa Marine Safety Office</u>

** AREA CODE (904)

<u>DIXIE</u> (Cross City)	
Civil Defense Director	498-3312
<u>LEVY</u> (Bronson)	
Adminsistrative Assistant	486-4311, ext. 32
Civil Defense Director	486-4311, ext. 32
<u>CITRUS</u> (Inverness)	
County Administrator	796-5021

** AREA CODE (813)

<u>PASCO</u> (New Port Richey)	
County Administrator	847-8115
Emergency Services Director	847-8188
<u>PINELLAS</u> (Clearwater)	
County Administrator	462-3485
Civil Emergency Services Director	530-6822
<u>HILLSBOROUGH</u> (Tampa)	
County Administrator	272-5750
Fire and Disaster Preparedness Director	223-1611
<u>MANATEE</u> (Bradenton)	
County Administrator	748-4501, ext. 3335
Emergency Services Director	748-4501, ext. 3300
<u>SARASOTA</u> (Sarasota)	
County Administrator	627-1101
Disaster Preparedness Coordinator	639-4092
<u>CHARLOTTE</u> (Port Charlotte)	
County Administrator	627-1101
Disaster Preparedness Coordinator	639-4092
<u>COLLIER</u> (Naples)	
County Manager	774-8383
Disaster Preparedness Coordinator	774-8444

** Miami Marine Safety Office

** AREA CODE (305)

MONROE (Key West)	
County Administrator	294-4641, ext. 100
DADE (Miami)	
County Manager	375-5151
Emergency Preparedness Director	596-8700
BROWARD (Ft. Lauderdale)	
County Administrator	357-7362
Emergency Preparedness Director	765-5020
PALM BEACH (West Palm Beach)	
County Administrator	837-2030
Emergency Management Director	683-0880
MARTIN (Stuart)	
County Administrator	283-6760
Public Safety Director	283-6760
ST. LUCIE (Ft. Pierce)	
County Administrator	466-1100, ext. 200
Disaster Preparedness Director	461-5201
INDIAN RIVER (Vero Beach)	
County Administrator	567-8000
Emergency Management Services	567-8000

**Jacksonville Marine Safety Office

BREVARD (Titusville)	
Administrative Director	269-8106
Public Safety Coordinator	631-1776

** AREA CODE (904)

VOLUSIA (Deland)	
County Manager	736-2700, ext. 2391
Civil Defense Coordinator	258-7000, ext. 4190
FLAGLER (Bunnell)	
Civil Defense Officer	437-3251
ST JOHNS (St. Augustine)	
County Administrator	829-5666
Public Safety Director	824-5550

DUVAL (Jacksonville)

Chief Administrative Officer	633-3703
Civil Defense Director	633-5410

NASSAU (Fernandina Beach)

Civil Defense Director	261-5962

APPENDIX C

DISCHARGE CLEANUP ORGANIZATIONS

A complete listing of available equipment and rate structures shall be maintained by the State Agency Coordinator

I. Northeast Florida
   A. Cooperatives
      1. Jacksonville Spillage Control, Inc.
         Post Office Box 3005
         Jacksonville, Florida 32206
         (904) 335-4164

      2. Port Canaveral-Brevard County Spillage
         Cleanup Committee, Inc.
         Post Office Box 331
         Cape Canaveral, Florida 32920
         (305) 783-2929

   B. Third Party Contractors
      1. Oil Recovery Co., Inc.
         Post Office Box 548
         Atlantic Beach, Florida 32233
         (904) 241-2200

      2. Pepper Industries, Inc.
         1830 East Bay Street
         Jacksonville, Florida 32202
         (904) 354-3333

      3. Containment Systems, Corp.
         Post Office Box 1390
         658 South Industry Road
         Cocoa, Florida 32922
         (305) 632-5640

      4. Cape Canaveral Marine Services, Inc.
         Post Office Box 904
         Cape Canaveral, Florida 32920
         (305) 784-2110/1425

      5. Canaveral Port Services, Co.
         Post Office Box 1169
         Cape Canaveral, Florida 32920
         (305) 784-4646

II. South Florida

A. Cooperatives

1. Port Everglades Spillage Committee
   Post Office Box 13136
   Ft. Lauderdale, Florida 33316
   (305) 524-0267

2. Port of Miami Spillage Committee
   1015 North America Way, 2nd
   Miami, Florida 33132
   (305) 371-7678

3. Port of Palm Beach Environmental
   Protection Committee
   Post Office Box 9935
   Riviera Beach, Florida 33404
   (305) 842-4201

B. Third Party Contractors

1. JPS Equipment, Inc.
   Oiltrol Division
   Post Office Box 13095
   Port Everglades, Florida 33316
   (305) 475-7200

2. Danmark, Inc.
   333 N.W. 23rd Street
   Miami, Florida 33127
   (305) 573-0610

3. Cliff Berry, Inc.
   Post Office Box 13079
   Port Everglades Station
   Ft. Lauderdale, Florida 33316
   (305) 763-3390

III. Northwest Florida

B. Third Party Contractors

1. E.C.P.C.S.
   1619 Moylan Road
   Panama City Beach, Florida 32407

REFERENCES

[1] The Sensitivity of Coastal Environments and Wildlife to Spilled Oil in Florida, Research Planning Institute, Inc., 1983.

[2] Informational Brochure, Florida Spillage Control Association, Inc.

[3] Florida Coastal Spill Contingency Plan, Florida Department of Natural Resources, July, 1984.

[4] "Letter of Agreement Between U.S. Coast Guard - Seventh District and the U.S. Environmental Protection Agency - Region IV and the State of Florida - Department of Environmental Regulation", September, 1984.

[5] South Florida Oil Spill Response Handbook, South Florida Regional Planning Council, July 1984.

[6] Hazardous Material Annex to the Florida Comprehensive Emergency Management Plan.